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An Investigation of Orientation in High Polymers. III. The Effect of Orientation on the Vitrification Temperature of Amorphous Polymers

cause the loss of the mobility of the chains (reference 7). The fact that the softening temperature of the orientated films of polystyrene is essentially higher than that of the non-orientated films, (on occasion of equal exterior stresses), shows that the relaxation processes in orientated polystyrene are frozen up. Simultaneously, the decrease stated here of the packing-density of polystyrene on occasion of its orientation (reference 3), as well as the presence of interior stresses might promote a decrease of the vitrification temperature.

The data obtained here may be explained as follows: The polystyrene without polar groups, which show a strong interaction cannot be regarded as a polymer, the vitrification of which is determined by the formation of lasting intermolecular bonds. High interior stresses cause a decrease of the softening temperature. This decrease is the greater, the greater the interior stresses (reference 4). Thus, the softening temperature of an orientated sample must be lower than it is in the case of a sample being not exposed to the influence of forces and which is non-orientated. Nevertheless, these temperatures coincide in the experimental range. This can

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only be connected with the fact that the straightening of the chain (which is the case on the occasion of an orientation) renders the transition of the chain from one configuration to the other more difficult, however, which is equivalent to an increase of the vitrification temperature. In the present case the softening temperature of an orientated polystyrene is determined by 1) the interior stresses decreasing the softening temperature, and 2) by the phenomenon of mechanic vitrification. Both effects possibly compensate one another to an arbitrary degree. The decrease of the interior stresses at the expense of their relaxation causes the fact that the temperature for the softening of the orientated sample will be higher, than of a non-orientated one. No coincidence of the softening temperatures of orientated samples with high stresses with those ones of the non-orientated sample exists in the case of polymethylmethacrylate. This corresponds to the conception given here on the loosening of structure of polymethylmethacrylate in the case of an orientation. There are 1 table, and 7 references, 4 of which are Slavic.

Card ~~4~~5

AUTHORS: Kargin, V. A. , Lipatov, Yu. S.

76-32-2-14/38

TITLE: Investigation of the Orientation in High Polymers (Issledovaniye oriyentatsii v vysokopolimerakh) IV. The Influence of the Cooling-Down Velocity on the Packing Density of Polymer Glasses Within the Range of Vitrification Temperature (IV. Vliyaniye skorosti okhlazhdeniya v intervale temperatury steklovaniya na plotnost' upakovki polimernykh stekol)

PERIODICAL: Zhurnal Fizicheskoy Khimii, 1958, Vol. 32, Nr 2, pp.326-331 (USSR)

ABSTRACT: In order to find out, to what degree the conditions of cooling-down in the case of polymers can influence the changes of the density of packing, experiments were carried out in order to investigate the sorption of low-molecular substances and to determine the heat of decomposition of differently treated polymers. The sorption measurements were carried out by means of Mac Ben (Mak-Ben) (?) spring scales. The decomposition heat was determined by means of an analogous adiabatic calo-

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rimeter described by S. M. Skuratov (Reference 10). Polymethylmethacrylate and polystyrene were the objects of investigation. Data for hardened annealed, orientated and not orientated samples were given. The sorption data show that by means of hardening, a structure with essentially greater porosity can be obtained compared with slowly cooled samples. The porosity of the polymer in consequence of hardening can essentially exceed that caused by orientation. It is shown that the modification of the decomposition heat-effects in the case of orientation are greater than those with hardened and annealed samples. It is shown that the changes of the density of packing which were observed in dependence of the variations of the cooling velocity of the polymer at a temperature exceeding the vitrification temperature, are remarkably smaller than the modifications of the density of packing observed in orientation. Thus the influence of the cooling velocity of an orientated polymer on the density of its packing is at any rate smaller than is the influence of the actual deformation conditions. The data obtained show that the packing densities are different in slowly and quickly cooled poly-

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methylmethacrylate. These differences are, however, of the same order of magnitude as those in high-molecular polymers. It is further shown that the processes of thermal relaxation proceed essentially faster in orientated polymers than those of the volume relaxation in not orientated polymers. The quick termination of the volume relaxation process causes the difficulty of obtaining structures with greatly different densities of packing in polymers. A great difference in the densities of packing in polymers can only be obtained by means of very strong chains as is the case with silicic acid. There are 2 figures, 4 tables, and 16 references, 11 of which are Soviet.

ASSOCIATION: Fiziko-khimicheskiy institut im. L. Ya. Karpova, Moskva
(Physico-chemical Institute imeni L. Ya. Karpov, Moscow)

SUBMITTED: November 22, 1956

Card 3/3

1. Polymers--Thermodynamic properties 2. Polymers--Chemical reactions

AUTHORS: Kargin, V. A., Kabanov, V. A.

76 32 3-5/43

TITLE: Investigation of the Structure of the ω -Polymer of Methyl Acrylate by Means of Physicochemical Methods (Izucheniye stroyeniya ω -polimera metilakrilata fiziko-khimicheskimi metodami)

PERIODICAL: Zhurnal Fizicheskoy Khimii, 1958, Vol 32, Nr 3, pp 520-527 (USSR)

ABSTRACT: Following the conceptions on the reaction mechanism of the ω -polymerization of A. N. Pravednikov and Medvedev (Refs 2, 4), experiments were performed by means of radiographic, thermomechanical and sorption methods for the purpose of explaining the structure of the obtained polymers. In radiographic comparative investigations of the ω - and μ -polymers, it was determined that the sharply marked differences of their properties can not be looked for in the chemical lay-out of the chain structure. The thermomechanical tests were performed on an earlier described dynamometrical scale in a large temperature interval. The samples were preliminarily treated (tableting) in two ways. From the results, it can be seen that no considerable difference of structural lattice density between

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the ω - and the μ -polymer exists, and that the three-dimensional lattice of both polymers is quite sparse. By the aid of the device according to Aleksandrov and Gayev (Ref 6), measurements of the deformation quantities of both polymers were performed, and the coincidence of the results was assumed to confirm the statements on the character of the lattice structure of these polymers. The investigation of sorption of the methyl propionate hydrated monomer of methyl acrylate in ω - and μ -polymers was performed on an earlier described device. In the experiments with low relative vapor pressure of the methyl propionate, a better sorption of the ω -polymer was observed which fact is explained by its content of micro-cavities. The assumption of a different chain mobility of both polymers is explained by fixed structural stresses in the ω -polymer, corresponding to the mechanism of the ω -polymerization according to A. N. Pravednikov and S. S. Medvedev. By means of the last mentioned assumption, also, the difference of both polymers at higher deformation stresses is represented. The test carried out with longer heating during the sorption investigations showed no particular destruction of the ω -polymer which fact

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is taken - as confirmation of the mentioned fixed chain stress. For the purpose of obtaining a transformation of the ω -polymer into a relaxed structure without micro-, or macro-cavities, as in the μ -polymer, tests were performed on ω -polymers by means of plasticisation, heating in air and exposure to γ -rays of radioactive Co^{60} . The plastification showed a destruction of the ω -polymer, as did heating. A subsequent irradiation of the soluble products by means of γ -rays in vacuum caused a reconstruction of the lattice, without however the stress characteristic of ω -polymers, and proved a real transformation into a μ -polymer. A γ -irradiation of ω - and μ -polymers in the vacuum showed no outward modification on the samples. They remained insoluble in acetone, whilst the experiments performed in air showed an oxidative destruction. On the other hand, at increased temperature, under certain conditions, a transformation of the ω -structure into the μ -polymer took place. There are 6 figures and 11 references, 8 of which are Soviet.

Card 3/4

AUTHORS: Kargin, V. A., Plate, N. A. 76-2-3-6/43

TITLE: The Physicochemical Investigation of the Structure and Properties of the ω -Polymer of Chloroprene (Fiziko-khimicheskoye issledovaniye stroyeniya i svoystv ω -polimera khloroprena)

PERIODICAL: Zhurnal Fizicheskoy Khimii, 1958, Vol 32, Nr 3, pp 528-533 (USSR)

ABSTRACT: Among the investigations performed in the field of ω -polymerization, the assumptions of A. N. Pravednikov and S. S. Medvedev (Ref 5) are emphasized. In the present paper structural, thermomechanical, thermodynamic, and other determination methods were applied. The ω - and μ -polymers of the chloroprene to be investigated were obtained according to an earlier described method in high vacuum. In parallel tests, a soluble linear product (called α polymer) from industrial synthetic chloroprene rubber of the type "Nairit 966" of the year 1955 was used. The radio- and electronographic determinations showed that the ω - and μ -polymers possess an amorphous structure and an identical chain structure. During investigations of the deformation dependence on temperature, it was observed that the ω -poly-

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mer apparently possesses a more dense spatial structure than the μ -polymer, by means of which it is more inelastic and therewith possesses a greater elasticity modulus. In this case also, a certain lattice potential is assumed. The temperature treatment of α - and μ -polymers produces thermal vulcanization, whereat the size of the high-elasticity modulus increases almost to that of the ω -polymer. For the ω -polymer, no thermal vulcanization takes place. This confirms the presence of a dense space lattice structure. The thermomechanical frequency-load tests pointed to a sparse space lattice structure in the μ -polymer, as well as to a linear structure in the α -polymer. Investigations of the sorption isothermal lines were performed in high vacuum, under application of the spring scale according to Mac-Ben, at 25°C. The near coincidence of the sorption isothermal lines of the α - and μ -polymers is observed. Hence it is concluded that the μ -polymer possesses a relatively sparse lattice structure, which fact, according to T. V. Gatovska, does not change the elasticity of the rubber molecules, whereas the small difference between the two sorption isothermal lines is explained by the presence

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of impurities (neozone, thioram) within the industrial product ω -polymer. Tests, which were performed by means of an irradiation with γ -rays (Co^{60}), show that in ω -polymers no change of the sorptive power takes place, whereas in α -polymers, the sorptive power decreased. The obtained experimental results agree with the assumption of A. N. Pravednikov and S. S. Medvedev on the structure of ω -polymers. There are 6 figures and 13 references, 8 of which are Soviet.

ASSOCIATION: Fiziko-khimicheskii institut im. L. Ya. Karpova, Moskovskiy gosudarstvennyy universitet im. M. V. Lomonosova, Moskva (Institute for Physical Chemistry imeni L. Ya. Karpov, Moscow State University imeni M. V. Lomonosov, Moscow)

SUBMITTED: August 7, 1956

Card 3/3

AUTHORS: Suleymanova, Z. I., Kargin, V. A.

76-32-4-13/43

TITLE: Investigation of the Mechanical Properties of Cellulose
Fibers (Izucheniye mekhanicheskikh svoystv tsellyuloz-
nykh volokon)

PERIODICAL: Zhurnal Fizicheskoy Khimii, 1958, Vol. 32, Nr 4.
pp. 811-818 (USSR)

ABSTRACT: In order to be able to better investigate cellulose pro-
perties the fiber was investigated in absolutely dry state,
and then the influence of small amounts of humidity (up
to 10%), as well as of the addition of plasticizers
(glycerin, urea, potassium lactate, glucose and triethyl-
benzylammonium) was determined. From the experimental part
can be seen that the mercerized or digested cotton fiber,
as well as viscose fiber were investigated by means of a
vacuum dynamometer according to Usmanov-Kargin. It was
observed that the absolutely dry cellulose fiber according
to the observations by Kh. U. Usmanov and V. A. Kargin
(Reference 1) shows a considerable deformability which
is explained by a loose molecular packing and small de-

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gree of orientation of the fiber. The addition of humidity up to 10% effects an essential increase of the deformation while above 10% the effect is no longer as intensive; from this is concluded that a slight decrease of humidity in this interval (up to 10%) brings about a strong decrease of deformation. The investigations with an addition of plasticizers showed that no special change of mechanical fiber properties takes place, but that the structure of the fiber can, on certain conditions, be deteriorated. Thus triethylbenzylammonium can exert negative effect on the fiber properties by an increase of the velocity of relaxation processes. From graphical representations can be seen that a mercerization in the case of tension and thus an increase of the degree of orientation of the cotton fiber does not cause any decrease of the deformability, since, according to the results obtained by Yu. S. Lipatov, V. A. Kargin, G. L. Slonimskiy (Reference 8) and V. A. Kargin and T. V. Gatovskaya (Reference 9) the conditions of orientation are decisive. It was found that the elasticity deformation of the fiber

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does not depend on the degree of orientation but on the course of the relaxation processes, with the previous treatment also playing a part in it. Finally the conclusion is made that the fiber elasticity in the case of small humidity content depends more on the heterogeneity of the structure, but that, on the other hand this effect can be compensated by an orientation elasticity. There are 3 figures, 2 tables and 13 references, all of which are Soviet.

ASSOCIATION: Fiziko-khimicheskiy Institut im. L. Ya. Karpova, Moskva;
Institut shinnoy promyshlennosti, Moskva (Moscow Physico-chemical Institute imeni L. Ya. Karpov; Moscow Institute of Tire Industry)

SUBMITTED: December 14, 1956

AVAILABLE: Library of Congress

Card 3/3 1. Cellulose fibers--Mechanical properties

AUTHORS: Tager, A. A., Kargin, V. A. 807 76-32-6-26/46

TITLE: Thermodynamic Investigation of the System Polymer-Hydrated Monomer (Termodinamicheskoye issledovaniye sistemy polimer-gidrirovanny monomer)II. The Solution Heat of Copolymers in the Mixture of Hydrated Monomers (II. Teploty rastvorennya sopolimerov v smesi gidrirovannykh monomerov)

PERIODICAL: Zhurnal fizicheskoy khimii, 1958, Vol. 32, Nr 6, pp. 1362 - 1366 (USSR)

ABSTRACT: The present paper investigates copolymers of butadiene and styrene as well as saponified polyvinylacetates at different degrees of saponification. M.Iovleva and Yu.Treskunova took part in the experimental part of the work. The types of butadiene- and styrene copolymers (their brand names being mentioned) to be investigated were supplied by the All Union Scientific Research Institute for Synthetic Rubbers. The polyvinylacetate was correspondingly saponified. A mixture of ethylbenzene and isooctane at a ratio corresponding to the composition of the copolymer was used as calorimetric liquid. From the experimental results shown in tables it may be seen that a higher content of butadiene (the types CKC 10, CKC 30) causes a heat absorption in the

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solution of the mixture of the corresponding hydrated monomers, while the increase of the amount of phenyl substituents shows a higher value of the solution heat. In classifying the obtained results the authors mention that an increase of the number of substituents causes a loosening of the molecular packing while in the presence of polar OH-groups no such loosening is noticed. The use of hydrogen bindings in polyvinyl alcohol was proved by S.N.Zhurkov and B.Ya.Levin (Ref 6), however, the heat absorption in the system polyvinyl alcohol-ethanol can not be fully explained, as there are two possibilities for it. Among other facts the investigations showed that at the transition from the polymer with mobile chains to one with fixed chains a continuous change of all thermodynamic properties of the solutions takes place. An additivity of the change of the mobility and density of the packing was found only within the range of from 20 to 70% butadiene, as, e.g. the introduction of 10% butadiene into the polystyrene chain changes these properties to a great extent; this agrees to the data obtained by A.I. Marey and M.Z.Al'tshuller (Ref 8). There are 2 figures, 3 tables,

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Thermodynamic Investigation of the System Polymer-
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and 8 references, which are Soviet.

ASSOCIATION: Vsesoyuznyy institut sinteticheskogo kauchuka, Ural'skiy gosudarstvennyy universitet im. A.M. Gor'kogo, Sverdlovsk (Sverdlovsk, All-Union Institute of Synthetic Rubber, Ural State University imeni A.M. Gor'kiy)

SUBMITTED: February 18, 1957

1. Polymers--Heat of solution

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5(4)

AUTHORS:

Tajer, A. A., Kargin, V. A.

SOV/76-32-12-7/32

TITLE:

The Solution Heat of Polymers and Their Hydrogenated Monomers in the Same Liquid (Teplota rastvoreniya polimerov i ikh gidrovannykh monomerov v odnoy i toy zhe zhidkosti)

PERIODICAL:

Zhurnal fizicheskoy khimii, 1958, Vol 32, Nr 12, pp 2694 - 2701 (USSR)

ABSTRACT:

Four cases are to be distinguished: 1) both the hydrated monomer and the polymer are amorphous; 2) the monomer is crystalline, the polymer amorphous; 3) the monomer is amorphous, the polymer crystalline; 4) both are crystalline. The present paper investigates only cases 1 and 2. Case 1: Test results show that the two solution heats are never equal. Two types of bindings are represented in the polymer: a) a large number of molecules is chemically combined in a polymer chain, b) between the chain there are much weaker intermolecular forces. Whereas in the hydrogenated monomer all molecules separate and mix with the molecules of the solvent, the polymeric chains remain combined and only the intermolecular forces must be overcome by the solution. Thus, the

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energy demand for the dissolution of polymers ought to be less than is the case of monomers. In this case, however, a correction is necessary because of the packing density of the polymer. A: The polymer packing is as dense as that of the monomer. In this case the above mentioned divergency was measured ($E_{\text{polym}} < E_{\text{monom}}$). B: The polymer packing is looser than that of the monomer. In this case less energy is required for the dissolution of the polymer and the divergency becomes even greater ($E_{\text{polym}} \ll E_{\text{monom}}$). - C. The polymer packing is denser than that of the monomer. In this case the intermolecular forces of the polymer can become so strong that more energy is required to dissolve the polymer than the monomer ($E_{\text{polym}} > E_{\text{monom}}$). Case 2: The same considerations apply. The polymer chains do not dissolve but the molecules of the monomer have yet to be extracted from their crystal lattice. Thus: $E_{\text{polym. amor.}} \ll E_{\text{monom. crystall.}}$. Also the effect of the crystal structure is shown, for example, by the energy difference in the dissolution of

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crystalline or glassy glucose. The energy difference is due to the crystallization heat. This disproves other theories (Refs 1,2, and 3). There are 2 tables and 9 references, 6 of which are Soviet.

ASSOCIATION: Ural'skiy gosudarstvennyy universitet im. A. M. Gor'kogo,
Sverdlovsk (Ural State University imeni A. M. Gor'kiy,
Sverdlovsk)

SUBMITTED: July 8, 1957

Card 3/3

AUTHORS:

Kargin, V. A., Member, Academy of Sciences, USSR,
Karyakina, M. I., Berestneva, Z. Ya. SGT/10-120-3-38/67

TITLE:

An Investigation of the Mechanism of the Protective Action
of Lacquer Coatings (Issledovaniye mekhanizma zashchitnogo
deystviya lakokrasochnykh pokrytiy)

PERIODICAL:

Doklady Akademii nauk SSSR, 1958, Vol. 120, Nr 5, pp.1065-1067
(USSR)

ABSTRACT:

This problem is reduced to the application of the aggressive substance to the surface of the corroded metal through the film. The film is assumed to be ideally penetrable for the aggressive substance. Electrochemical methods are best suited for this study. The problem of the experimental investigation is basically that of maintaining a constant current in a system with a varying resistance. The maximum voltage employed in these experiments was 3 000 V. The current was automatically kept at 10 milliamperes. A 0.01 N soda solution served as electrolyte, a platinum plate as cathode and an iron rod covered with the lacquer to be investigated as anode. On the sample coated with lacquer only a few corrosion centers are

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formed. Because of the great adhesion of the lacquer coating no suitable conditions prevail at the boundary between the metal and the film for the formation of a new phase. The oxides produced dissolve in the lacquer coating, diffuse through the film and are separated at the boundary between the lacquer coating and the solution. When tests were carried out by means of the method of cathodic polarization the lacquer coating separated from the metal in places where the adhesion is smallest. Thus little bubbles are formed, the continuity of the lacquer coating, however, is maintained. The method developed in this investigation permits to estimate the protective effect of lacquer coatings. There are 6 references, 3 of which are Soviet.

ASSOCIATION: Nauchno-issledovatel'skiy fiziko-khimicheskiy institut im.
L. Ya. Karpova
(Physical and Chemical Scientific Research Institute imeni
L. Ya. Karpov)

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AUTHORS: Kargin, V. A., Member, Academy of Sciences, SOV/20-120-6.31/59
USSR, Sogolova, T. I., Aykhodzhayev, B. I.

TITLE: Properties of Guttapercha in Amorphous State (Svoystva gutta-
perchi v amorfnom sostoyanii)

PERIODICAL: Doklady Akademii nauk SSSR, 1958, Vol 120, Nr 6,
pp 1277 - 1279 (USSR)

ABSTRACT: In the paper under review it is attempted to determine the
influence of the degree of ordering of chain molecules upon
the properties of a polymer. Guttapercha, which is a natural
crystalline polymer, was used in this investigation. Different
states of ordering could be fixed by a vulcanization at different
temperatures. The vulcanization was carried out at 143° by
finely dispersed sulfur, at 70° and 20° in S₂Cl₂ vapors and at
20° by mixing a solution of guttapercha in CCl₄ and by mixing
a solution of S₂Cl₂ in ether. Data concerning the initial and the
guttapercha vulcanized under different conditions are presented
in a table. By means of fixing the different states of gutta-
percha at different temperatures it was possible to determine

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the mechanical properties of guttapercha during the transition from the completely disordered state into the completely ordered state. According to the evidence presented the degree of amorphism of structured crystalline polymers is not only dependent upon the quantity of the formed transverse bindings, but to a high degree also upon the state of the polymer during the structuration process. The smaller the structuration of the polymer, the less thorough will be the subsequent crystallization. At a given content of bound sulfur two completely different types of bound guttapercha with entirely differing mechanical and physical properties can be obtained. At higher vulcanization temperatures a better ordered arrangement of the chain molecules is fixed. This corresponds to an increased deformability, to smaller values of Young's modulus and of the vitrification temperature. There are 1 figure, 1 table, and 11 references, 7 of which are Soviet.

ASSOCIATION: Fiziko-khimicheskiy institut im.L.Ya.Karpova (Physicochemical Institute imeni L.Ya.Karpov)

Card 2/3

5(4)

AUTHORS: Kargin, V. A., Academician, Bakeyev, N. F., Vergin, Kh. SOV/20-122-1-26/44

TITLE: ~~On the Formation of Geometrically Ordered Structures in~~
Amorphous Polymers (O vozniknovenii geometricheski uporya-
dochennykh struktur v amorfnykh polimerakh)

PERIODICAL: Doklady Akademii nauk SSSR, 1958, Vol 122, Nr 1, pp 97-98
(USSR)

ABSTRACT: The purpose of this paper is an electron microscopic inves-
tigation of the structure of some amorphous polymers of various
structures of the molecular chains. These investigations were
carried out on polymers of arsenic (salvarsan), polyacryl-
amide, and on the copolymer on the basis of methylmetacrylate
and metacrylic acid. Therefore, the authors investigate poly-
mers which contain various polar groups in the chain and,
therefore have different intramolecular and intermolecular
interaction forces. The samples for the investigation were
produced by fastening of the polymer solution on a film and
subsequent evaporation of the solvent. The investigations
were carried out with direct 18 000 - 20 000-fold electron
microscopic enlargements. According to these investigations,

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salvarsan, polyacrylamide, and the copolymer on the basis of methylmetacrylate and metacrylic acid form individual secondary aggregates in diluted solutions. These aggregates have the shape of molecular packets of various dimensions and shapes. For salvarsan and polyacrylamide, the formation of geometrically regular structures (rectilinear organic molecular packets) were observed. The regular shape of these packets is very noticeable. A packet composed of parallel molecular chains maintains the flexibility of a single individual chain. The revolutions of the packets by definite angles may cause the formation of geometrically regular structures in amorphous polymers. 3 figures show the microphotographies of the investigated polymers. These photographs were taken from concentrated solutions. The results of this paper confirmed the following assumption: The structure of the amorphous polymers has to be considered as a system of ordered molecular packets. The authors thank Professor M. Ya. Kraft and his fellow workers who placed the salvarsan to the authors' disposal. There are 2 references, all of which are Soviet.

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AUTHORS: Kargin, V. A., Member, Academy of Sciences, USSR, Berestnev, V. A., Gatovskaya, T. V., Yaminskaya, Ye. Ya. SOV/20-122-4-36/57

TITLE: On the Mechanism of Fiber Failure (K voprosu o mekhanizme razrusheniya volokna)

PERIODICAL: Doklady Akademii nauk SSSR, 1958, Vol 122, Nr 4, pp 668-670 (USSR)

ABSTRACT: It has been previously proved that the variations of the molecular structure of cord-caprone fibers with various mechanical influences are not large. Therefore, it cannot be said that these changes play an important role in the destruction process of a fiber (Ref 1). It has been assumed that the decisive factor, which was responsible for the destruction of the fiber with repeated cyclic influence, is the development of macrodefects in the material. The direct experimental proof of this fact was of interest. For this purpose, determinations of the stability of the cordcaprone fiber were carried out after the fiber had been treated with a surface-active agent (oleic acid). By this, the surface tension was reduced, in particular on the

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damaged spots of the fiber. Thus, the macrodefects were able to expand (Ref 2). This is confirmed by table 1. Washing out of the cord by means of carbon tetrachloride for the removal of the oleic acid increases the solidity of the fiber (Table 1, Sample 3). Table 1 gives further evidence on the stability and stretch (up to fatigue) of the investigated samples. These data remain unchanged, without dependence upon the kind of treatment of the fiber. Thus, with destruction of the cord by a repeated and single type of influence, different factors play the important role. In the first case the macro defects are mainly responsible, whereas during just one operation (tension test on a dynamometer) the effect of these factors is not large. Possibly, in this case the destruction of the cord is substantially related to the simultaneous destruction of a large number of molecular chains in the weakest places of the fiber. In order to confirm this assumption the viscosity of the fiber solutions before and after the mechanical treatment (repeated cyclic extension and breaking on the dynamometer) was measured. The results of the characteristic viscosity of these solutions in an 85 % formic

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acid solution are given in table 2. It is seen from this that the decrease in viscosity of solutions from fibers, which have been torn on the dynamometer, is considerably higher than with a repeated extension. During fatigue the viscosity value falls somewhat in the initial period and then remains stable even at breaking. Inversely, at breaking on the dynamometer the specific viscosity is maintained up to the destruction of the fiber. At the time and on the site of breaking only, it drops rapidly. Therefore, it might be supposed that the destruction of a fiber in consequence of repeated mechanical influence is due to the continuous development of macrodefects at depth. During this, only a few chains are broken in a small cross section; during a single extension, the breaking of a considerable number of molecular chains in a weak part of the fiber determines the destruction of the fiber. There are 2 tables and 2 references, 2 of which are Soviet.

Card ~~3~~4

KARGIN, V. A.

"Basic Problems of the Chemistry of Polymers."

report presented at the Planary Session, 8th Mendeleyev Congress, Moscow, 14-18
Mar 59.

BERESTNEVA, Z. Ya. and KARGIN, V. A.

"The Crystallization Mechanism of Colloid Titanium Dioxide."

report presented at the Section on Colloid Chemistry, VIII Mendeleyev Conference of General and Applied Chemistry, Moscow, 16-23 March 1959.
(Koll. Zhur. v. 21, No. 4, pp. 509-511)

KARGIN, V.A.

"The ordering process in amorphous polymers and in crystallization
mechanism."

report presented at the Intl Symposium on Macromolecules, Wiesbaden, Germany, 12-27 Oct '59.

15(8)

AUTHOR:

Kargin, V. A., Akademich

SOV/30-59-1-4/57

TITLE:

Basic Problems of Polymeric Chemistry (Osnovnyye problemy khimii polimerov)

PERIODICAL:

Vestnik Akademii nauk SSSR, 1959, Nr 1, pp 32-43 (USSR)

ABSTRACT:

Essential tasks of research in the field of polymers are the synthesis of polymeric molecules and the obtaining of polymeric substances and products. Highly molecular substances must be protected from the influence of light, heat, radiation, and mechanical interference. A basic trend of polymeric chemistry is the synthesis of substances which show a thermal and oxidizing stability. Industry demands a solution of problems connected with the working-up of polymers into products. Polymers with a chain of phosphorus, nitrogen, and boron atoms have recently attracted attention. Polycondensation and radical polymerization are indicated as the only practical method to obtain large molecules. New procedures are polymerization in a solid state, and of the free biradicals, respectively. Further, the inoculating methods are described, emphasizing that they should be carried out with very pure polymers without access of oxygen. Reinforced

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Basic Problems of Polymeric Chemistry

SOV/30-59-1-4/57

synthetic materials are considered interesting. The author notes that cellulose, being a natural polymer, has been partially displaced by synthetic polymers. The production of films from strong polymeric electrolytes is pointed out as a new line. The author refers to V. Kun who, in common with his collaborators, showed that a change of the charge, or of the dissociation, respectively, of the polymeric electrolyte brings about a change of concentration of the polymeric acid. The production of fibers of the asbestos type is also considered to be an important problem in the field of inorganic polymers. Important changes can be observed in the direction of scientific work in the field of structural research. Special interest is devoted to biological structures. Finally, the author states that new polymers and their methods of production, the practical use of polymers, and the biologically active polymers have determined the development of chemistry of polymers in recent years. The author recommends the training of polymer specialists, each of whom should head one sector of this science and have a good understanding of the whole field.

Card 2/2

KARGIN, V.A.; KABANDV, V.A.; MARCHENKO, I.Yu.

Synthesis and mechanical properties of isotactic polystyrene.
Vysokom.soed. 1 no.1:94-102 Ja '59. (MIRA 12:9)

1. Khimicheskiy fakul'tet Moskovskogo gosudarstvennogo univer-
siteta im. M.V.Lomonosova, Kafedra vysokomolekulyarnykh soedineniy.
(Styrene)

KARGIN, V.A.; KOZLOV, P.V.; PLATE, N.A.; KONONEVA, I.I.

Method of obtaining graft polymers from starch and styrene and investigation of their properties. Vysokom.soad. 1 no.1:114-122 Ja '59. (MIRA 12:9)

1. Khimicheskiy fakul'tet Moskovskogo gosudarstvennogo universiteta im. M.V.Lomonosova, Kafedra vysokomolekulyarnykh soyedineniy.
(Styrene) (Starch) (Polymers)

KARGIN, V.A.; USMANOV, Kh.U.; AYKHODZHAYEV, B.I.

Obtaining graft polymers by cellulose ozonation. Vysokom. soed.
1 no.1:149-151 Ja '59. (MIRA 12:9)

1. Fiziko-khimicheskiy institut im. L.Ya.Karpova i Institut khimii
rastitel'nykh veshchestv AN UzSSR.
(Polymers) (Cellulose)

KOCHESHKOV, K.A.; KARGIN, V.A.; TALALAYEVA, T.V.; SOGOLOVA, T.I.;
PALEYEV, O.A.

Macromolecular polymers of ethylene obtained from mixtures of
lithium organic compounds with titanium tetrachloride. Vysokom.
soed. 1 no.1:152-156 Ja '59. (MIRA 12:9)

1. Fiziko-khimicheskiy institut im. L.Ya.Karpova.
(Ethylene) (Lithium organic compounds) (Titanium chloride)

KARGIN, V.A.; BAKETEV, N.F.; RYZHOV, V.B.

Processes of structure formation in solutions of carbohydrate
polyacrylate polymers. Vysokom.sped. 1 no.2:182-184 F '59.
(MIRA 12:10)

1. Moskovskiy gosudarstvennyy universitet im. M.V.Lomonosova,
Khimicheskiy fakul'tet.
(Polymers) (Carbohydrates) (Acrylic acid)

KARGIN, V.A.; MIRLINA, S.Ya.; NAGORNAYA, Yu.F.

Study of the anisotropy of electroconductivity of polymer
electrolytes. Vysokom.sped. 1 no.2:191-200 F '59.
(MIRA 12:10)

1. Moskovskiy gosuniversitet im. M.V.Lomonosova, Khimicheskiy
fakul'tet.
(Electrolytes--Conductivity) (Anisotropy)

KARGIN, V.A.; KABANOV, V.A.; ZUBOV, V.P.

Polymerization in systems obtained by the molecular beams.
Vysokom.soed. 1 no.2:265-268 F '59. (MIRA 12:10)

1. moskovskiy gosuniversitet im. M.V.Lomonosova, Khimicheskii
fakul'tet, Kafedra vysokomolekulyarnykh soyedineniy.
(Polymerization)

KARGIN, V.A.; KABANOV, V.A.; ANDRIANOVA, G.P.

Heterogeneous polymerization of sodium acrylate in the presence
of other salts. Vysokom.sped. 1 no.2:301-307 F '59.
(MIRA 12:10)

1. Moskovskiy gosuniversitet im. M.V.Lomonosova, Khimicheskiy
fakul'tet, Kafedra vysokomolekulyarnykh soedineniy.
(Acrylic acid) (Polymerization)

KARGIN, V.A.; PLER... ..

Chemical ... on crystalline surfaces. Vyskom.soed. 1 no.2:
330-331 ... (MIRA 12:10)

1. Khimicheskiy fakul'tet Moskovskogo gosuniversiteta im. M.V.
Lomonosova, ... vysokomolekulyarnykh soedineniy.
(Polymers)

BERESTNEV, V.A.; GATOVSKAYA, T.V.; ~~KARGIN, V.A.~~; YAMINSKAYA, Ye.Ya.

Study of the physicochemical properties of cord fibers.
Part 2: Effect of thermal and mechanical action on the sorption
properties of capron cord. Vysokom. soed. 1 no.3:337-341 Mr '59.
(MIRA 12:10)

1.Fiziko-khimicheskiy institut im. L.Ya. Karpova i Nauchno-
issledovatel'skiy institut shinnoy promyshlennosti,
(Nylon)

BERESTNEV, V.A.; GATOVSKAYA, T.V.; KARGIN, V.A.; YAMINSKAYA, Ye.Ya.

Study of the physicochemical properties of cord fibers. Part 3:
Some changes in the structure of fibers occurring in repeated cyclic
stretching. Vysokom. soed. 1 no.3:373-377 Mr '59.
(MIRA 12:10)

1.Fiziko-khimicheskiy institut im. L.Ya. Karpova i Nauchno-
issledovatel'skiy institut shinnoy promyshlennosti.
(Nylon--Testing)

KARGIN, V.A.; PLATE, N.A.; DUDNIK, L.A.

Polymer obtained from bicyclo-[2,2,1]-heptadiene. Vysokom. soed. 1
no.3:420-424 Mr '59. (MIRA 12:10)

1.Khimicheskiy fakul'tet Moskovskogo gosuniversiteta.
(Polymers) (Bicycloheptadiene)

KARGIN, V.A.; SOGOLOVA, T.I.; AYKHODZHAYEV, B.I.

Effect of the structure developing process on the crystalline
state of gutta-percha. Vysokom.sped. 1 no.4:539-541 Ap '59.
(MIRA 12:9)

1. Fiziko-khimicheskiy institut im. L.Ya.Karpova.
(Gutta-percha)

ORLOVA, A.V.; BERESTNEV, V.A.; KARGIN, V.A.

Disintegration of fibers due to mechanical action. Vysokom.sped.
1 no.5:740-742 My '59. (MIRA 12:10)

1. Nauchno-issledovatel'skiy institut shinnoy promyshlennosti.
(Textile fibers, Synthetic)

KARGIN, V.A.; KONSTANTINOPOL'SKAYA, M.B.; BERESTNEVA, Z.Ya.

Study of the wettability of solid surfaces by polymers. Vysokom.sosd.
1 no.7:1074-1076 J1 '59. (MIRA 12:11)

1. Fiziko-khimicheskiy institut im. L.Ya.Karpova.
(Wetting)

KARGIN, V.A.; GORINA, A.A.; KORETSKAYA, T.A.

Electron microscope study of the mechanism of sintering of
polytetrafluoroethylene (fluoroplast-r). Vysokom.sped. 1
no.8:1143-1147 Ag '59. (MIRA 13:2)

1. Nauchno-issledovatel'skiy institut plasticheskikh mass.
(Ethylene)

SELIKHOVA, V.I.; MARKOVA, G.S.; KARGIN, V.A.

Comparative study of highly oriented crystalline and
amorphous polymers. Vysokom.sped. 1 no.8:1214-1226
Ag '59. (MIRA 13:2)

1. Fiziko-khimicheskiy institut im. L.Ya.Karpova.
(Polymers--Spectra)

SELIKHOVA, V.I.; MARKOVA, G.S.; KARGIN, V.A.

Structural changes in oriented crystalline and amorphous
polymers in the region of softening temperatures. Vysokom.
soed. 1 no.8:1236-1241 Ag '59. (MIRA 13:2)

1. Fiziko-khimicheskiy institut im. L.Ya.Karpova.
(Polymers--Thermal properties)
(Polymers--Spectra)

IGONIN, L.A.; YERMOLINA, A.V.; OVCHINNIKOVA, Yu.V.; KARGIN, V.A.

Molecular ordering of polymers precipitated from solution.
Vysokom. soed. 1 no.9:1327-1332 S '59. (MIRA 13:3)

1. Vsesoyuznyy nauchno-issledovatel'skiy institut plasticheskikh
mass.
(Polymers) (Ethylene) (Methacrylic acid)

KABANOV, V.A.; ZUBOV, V.P.; KARGIN, V.A.

Polymerization of styrene on a Ziegler type catalyst with the aid of
the molecular beam method. Vysokom. soed. 1 no.9:1422-1427 S '59.
(MIRA 13:3)

1. Moskovskiy gosudarstvennyy universitet im. Lomonosova.
(Styrene) (Titanium chloride) (Aluminum organic compounds)

KARGIN, V.A.; MIRLINA, S.Ya.; ANTEPINA, A.D.

Electrochemical properties and shapes of the molecules of acrylic acid and ethylenesulfonic acid copolymers. Vysokom. soed. 1 no.9: 1428-1427 S '59. (MIRA 13:3)

1. Moskovskiy gosudarstvennyy universitet im. Lomonosova.
(Acrylic acid) (Ethylenesulfonic acid)

KARGIN, V.A.; PLATE, N.A.; REBINDER, Ye.P.

Certain properties of starch and methyl methacrylate graft
copolymers. Vysokom.soed. 1 no.10:1547-1551 0 '59.
(MIRA 13:3)

1. Khimicheskiy fakul'tet Moskovskogo gosudarstvennogo
universiteta, kafedra vysokomolekulyarnykh soyedineniy.
(Starch) (Methacrylic acid) (Polymers)

KARGIN, V.A.; SOGOLOVA, T.I.; TALIPOV, G.Sh.

Plasticization of crystalline polymers. Part 1: Plasticization
of isotactic polystyrene and polyethylene terephthalate.
Vysokom.soed. 1 no.11:1670-1677 N '59. (MIRA 13:5)

1. Fiziko-khimicheskiy institut imeni L.Ya.Karpova.
(Styrene) (Terephthalic acid)

PLATE, N.A.; PROKOPENKO, V.V.; KARGIN, V.A.

Polymerization of certain monomers during the dispersion of
inorganic substances. Vysokom.sped. 1 no.11:1713-1720 N
'59. (MIRA 13:5)

1. Khimicheskiy fakul'tet Moskovskogo gosudarstvennogo universiteta
imeni M.V. Lomonosova.
(Polymerization) (Styrene) (Methacrylic acid)

KARGIN, V.A.; KORETSKAYA, T.A.

Mechanism of formation of polymer crystals. Part 1. Vysokom.
soed. 1 no.11:1721-1723 N '59. (MIRA 13:5)

1. Fiziko-khimicheskiy institut imeni L. Ya.Karpova.
(Polymers) (Crystals)

BAKEYEV, N.F.; PSHEZHETSKIY, V.S.; KARGIN, V.A.

Electron microscope study of structure arising during interaction between polyelectrolyte macromolecules. Vysokom.sped.

1 no.12:1812-1816 D '59. (MIRA 13:5)

1. Moskovskiy gosudarstvennyy universitet. Khimicheskiy fakul'tet.

(Electrolytes) (Macromolecular compounds)

PLATE, N.A.; SHIBAYEV, V.P.; KARGIN, V.A.

Some methods of synthesizing graft polymers. Vysokom.sped.
1 no.12:1853-1858 D '59. (MIRA 13:5)

1. Moskovskiy gosudarstvennyy universitet. Khimicheskiy fakul'-
tet.

(Polymers)

KABANOV, V.A.; SERGEYEV, G.B.; ZUBOV, V.P.; KARGIN, V.A.

Electron resonance study of polymerization in the system acrylonitrile - magnesium, obtained by molecular beam condensation.
Vysokom.soed. 1 no.12:1859-1861 D '59. (MIRA 13:5)

1. Moskovskiy gosudarstvennyy universitet.
(Polymerization--Spectra) (Acrylonitrile) (Magnesium)

SOV/30-59-2-20/60

15(8)

AUTHORS:

Kargin, V. A., Academician
Bresler, S. Ye., Doctor of Chemical Sciences

TITLE:

News in Brief (Kratkiye soobshcheniya)
Gordon Conferences (Gordonovskiye konferentsii)

PERIODICAL:

Vestnik Akademii nauk SSSR, 1959, Nr 2, pp 77-78 (USSR)

ABSTRACT:

The Conference on Problems of Polymerization took place in the State of New Hampshire from June 30 until July 4, 1958. The members of the Soviet delegation taking part were: V. A. Kargin, S. Ye. Bresler, V. S. Smirnov. The problem of the polymerization process under the action of organo-metallic complexes was discussed. S. Ye. Bresler spoke about investigation results obtained in his and in A. A. Korotkov's laboratory. He dealt with the problem of the polymerization process of isoprene under the action of butyl lithium and other organo-metallic substances. After the end of the Conference the Soviet delegation visited a number of institutes and laboratories in New York, Boston, Washington and New Jersey with a high degree of mechanization of work. The method of paramagnetic nuclear resonance for the investigation of the structure of complex organic compounds as well as of infrared spectroscopy is very widespread.

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5(3), 15(8)

AUTHORS:

Gorina, A. A., Kargin, V. A., Kozlov, P. M. SOV/64-59-2-9/23

TITLE:

Preparation of Phtoroplast-4 in Finished Products (Pererabotka ftoroplasta-4 v izdeliya)
(Investigations on the Sintering Process of Semifinished Products)
(Issledovaniya protsessa spekaniya zagotovok)

PERIODICAL:

Khimicheskaya promyshlennost', 1959, Nr 2, pp 134-139 (USSR)

ABSTRACT:

The process of pelleting was discussed in the preceding paper (Ref 1). The investigations of the sintering of semifinished phtoroplast-4 (polytetrafluoroethylene) (PTF)-products was carried out in two stages; first, the optimum conditions for the sintering were examined, and second, the mechanism of the process was investigated. Volume- and linear shrinkage are regarded as criteria for the evaluation of the summation processes in sintering. Since the proportion by volume between the crystalline and the amorphous component of the polymer is a function of temperature, corresponding X-ray analyses were made, and it was found that at a temperature of up to 300° no considerable changes in the degree of crystallization are to be observed. Only at 340° the polymer loses its crystal structure (Ref 2). The sintering of semifinished products should

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Preparation of Phtoroplast-4 in Finished Products
(Investigations on the Sintering Process of Semifinished Products)

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therefore take place at $375 \pm 5^\circ$. The experiments were made within a large range of pelleting pressure ($50-500 \text{ kg/cm}^2$) and at sintering temperatures of 340, 360, 380, and 400° at two different heating velocities of the tablets to the sintering temperature, and at three different cooling velocities of the semifinished products after the sintering. The change in the linear dimension and in the density of the sample was examined for the evaluation of the sintering process. The results obtained are graphically represented (Figs 1-6). Optimum pressure in pelleting was determined to be $350-500 \text{ kg/cm}^2$. In the case of small products of (PF) the heating velocity to the sintering temperature is of no importance, the optimum temperature range for sintering is $375 \pm 15^\circ$ (lower limit for low thermostability, upper one for highly thermostable polymers). Sintering takes place until the complete clarification of the polymer. There are 6 figures and 9 references, 4 of which are Soviet.

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SOV/64-59-4-5/27

28(5), 15(7)

AUTHORS:

Sysina, L. A., Kargin, V. A.

TITLE:

Investigation of the Process of the Formation of Films out of Polytrifluoro Chloro Ethylene (Izucheniye protsessy formovaniya plenok politrifuorkhloroetilena)

PERIODICAL:

Khimicheskaya promyshlennost', 1959, Nr 4, pp 20-23 (USSR)

ABSTRACT:

The practice shows that the coats of polytrifluorochloro ethylene (P) detach from the basis which in spite of the corrosionproof properties of (P) causes a corrosion of the base. It is assumed that this phenomenon is caused by the occurrence of stress during the formation of the film. In order to investigate the processes occurring in the formation of the film from (P), two methods already described in publications were applied in the present case; the examination of the stresses occurring in films which are applied to easily deformable bases (with the apparatus of Polyan'i) or on solid metal bases (according to the method of concentric circles) and investigations of the relaxation of the stresses of finished films at 100-220° by means of the apparatus of Polyan'i and at 270° after alteration of the linear dimensions of the films. A fine glass texture was used as easily deformable base and an aluminum foil of the type F. G. (OST MPTU 2104-49) of a thickness of 0.05 - 0.02 mm as solid base. In the first case

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Investigation of the Process of the Formation of Films out of Polytri-
fluoro Chloro Ethylene

it was found that the above mentioned stresses do not occur during the drying process and the melting of the film but during a quick cooling of the (F)-films which may also be observed with the Al-foils (Table). In the case of a slow cooling in a heating apparatus, however, no stresses occur in the (F)-films. These films, however, have low adhesion and a higher degree of crystallization. This is explained by the fact that in a slow cooling the polymer chains have enough time for relaxation. Since (F), however, belongs to the crystallizing polymers the relaxation process becomes complicated and it is not possible to obtain an amorphous film without stresses. Investigations on the stress relaxation carried through with (F)-films on the Polyan'i apparatus without base (the films were extended to 170% and heated to 100-200°) showed a sharp decrease of the stresses. The heating to 100-200° does not permit the production of amorphous films free from stresses because crystallization takes place in the above-mentioned relaxation. By melting on the (F)-films at 265-270° on a teflon-base in order to obtain stress relaxation, released (F)-films could be obtained. It was found that the stresses of the (F)-films have not the decisive im-

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Investigation of the Process of the Formation of Films out of Polytri-
fluoro Chloro Ethylene

portance of the behavior of these coats. There are 3 figures,
1 table, and 9 references, 8 of which are Soviet.

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15(9), 18(7)
AUTHORS:

Sysina, L. A., Kargin, V. A.

SOV/64-59-5-2/28

TITLE:

Investigation of the Mechanism of the Protective Action and Crystallization Process of Polytrifluorochloro Ethylene Films

PERIODICAL:

Khimicheskaya promyshlennost', 1959, Nr 5, pp 378-383 (USSR)

ABSTRACT:

Polytrifluorochloro ethylene has a very good protective effect against corrosion owing to its chemical properties. It was found, however, that corrosion spots form under the coatings and that a detachment of the coating film occurs. It was assumed (Ref 1) that this detachment is caused by tensions occurring in the coating film while drying. Since these tensions are but small and do not occur at all in the case of crystallization (in the coating film), but on the other hand crystallization spoils the protective effect against corrosion, investigations of this problem were continued. The adhesion of the coating film is of special importance when the latter is detached, since a coating film of good adhesion, though permeable to corrosive media, has a better protective effect against corrosion than detaching films. In order to investigate the protective effect against corrosion of polytrifluorochloro ethylene film, the solubility of water (I), nitric acid (II), and mesitylene (III)

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Investigation of the Mechanism of the Protective Action SOV/64-59-5-2/28
and Crystallization Process of Polytrifluorochloro Ethylene Films

in polytrifluorochloro ethylene was tested and the difference between amorphous and crystalline coating films, as well as their packing density determined. Sorption tests were carried out by means of Mac Ben's sorption balance (Ref 4) in high vacuum (10^{-5} mm Hg) at 25°C , which proved that (I) and (III) diffuse polytrifluorochloro ethylene films and that there is no protective effect against corrosion. It was further found that the latter is determined by adhesion of the coating film on the metal surface, which was also confirmed by tests with the badly adhering polymer of trifluorochloro ethylene of low molecular weight. The degree of adhesion (Table 1, measured on AD-1M aluminum and 12Kh5MA steel) depends on the material to be protected as well as on the structure of the coating film (crystallization, preliminary treatment, etc). Investigations of the crystallization of polytrifluorochloro ethylene by the dilatometric (Figs 1-4) and roentgenographic methods (Figs 5-8, radiographs) showed that in the case of reannealing of amorphous thermoset coating films their volumes are reduced, condensation takes place, and crystallization occurs. The influence exerted by the formation of spherulites on the

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Investigation of the Mechanism of the Protective Action SOV/64-59-5-2/28
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specific volume of the coating films was also investigated (Table 2). The effect of the crystallization degree on the mechanical properties of the polytrifluorochloro ethylene films was investigated by means of the RMM-30A dynamometer as well as the modulus of elasticity on the Polanyi device (Table 3). Thus, it was ascertained that with increasing degree of crystallization the resistance of the coating films is raised, simultaneously reducing adhesion. For the preparation of highly effective protective coatings against corrosion, the surface state of the metal must be taken into consideration and thermosetting the coating film must be carried out under conditions excluding crystallization. There are 8 figures, 3 tables, and 21 references, 7 of which are Soviet.

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SOV/138-59-4-14/26

AUTHORS: Kuz'minskiy, A.S. and Bass, S.I.

TITLE: The VIIIth Mendeleyev Congress (VIII Mendeleyevskiy s"yezd)

PERIODICAL: Kauchuk i Rezina, 1959, Nr 4, pp 47-48 (USSR)

ABSTRACT: This Congress on Pure and Applied Chemistry was held from 16th to 23rd March, 1959 in Moscow, and was attended by 1 500 representatives of Soviet Research Institutes, chemical factories and many foreign associations. Academician A.N. Nesmeyanov opened the meeting and emphasised the importance of the Mendeleyev Congresses. V.S. Fedorov, representative of the Gosudarstvennyy Komitet Soveta Ministrov SSSR po khimii (State Committee of the Council of Ministers of the USSR for Chemistry) drew attention to Soviet achievements in chemistry. The following papers were read during the Congress: V.A. Kargin on the "Basic Problems in the Chemistry of Polymers"; A.N. Nesmeyanov on "The Periodic Law of D.I. Mendeleyev and Organic Chemistry"; N.W. Semenov

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The VIIIth Mendeleev Congress

on "Basic Problems of Chemical Kinetics"; A.P. Aleksandrov on "Chemical Aspects of Utilizing Atomic Energy"; Ya. K. Syrkin, Corresponding Member of the Academy of Sciences of the USSR, on "The Basic Problems of the Theory of Chemical Bonds" etc. Special attention was drawn to the chemistry of high-molecular compounds and to methods for preparing starting materials for the synthesis of polymers based on petroleum crudes, further modification of the properties of polymers (block- and graft polymers, radiation vulcanisation etc.). V.A. Kargin discussed three main aspects of polymer chemistry: preparation of polymers which can be used within wide temperature ranges; preparation of new and easily accessible polymer materials and processing of polymers. Further details of the lectures are to be published at a later date.

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SOV/63-4-6-1/37

AUTHORS: Professor Rogovin, Z. A., Academician Kargin, V. A.

TITLE: Some Scientific and Technical Problems of Cellulose Processing

PERIODICAL: Khimicheskaya nauka i promyshlennost', 1959, Vol 4, Nr 6, pp 690-696 (USSR)

ABSTRACT: The authors stress the importance of further studies on cellulose polymers which have been neglected in the USSR during the past years in favor of synthetic polymers. In view of the inexhaustible amounts of cellulose raw materials, it is imperative that more attention be given to these natural resources. In particular, studies should be directed towards: (1) modification of the characteristics of cellulose; (2) improvement of the quality and durability of cellulose materials; (3) development of new, and the improvement of existing, manufacturing methods. Compared with synthetic fibers, cellulose fibers have the following deficiencies: low resistance to the action of chemical agents and

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microorganisms; lower elasticity and abrasion resistance; higher thermal conductivity and inflammability. These characteristics can be modified by various methods, such as: introduction of various substituents into the cellulose macromolecule; introduction of new functional groups (e.g., nitrile and amino groups); obtaining graft copolymers of cellulose and carbon chain or hetero-chain synthetic polymers; processing with flammability-reducing and wrinkle-resistance-imparting agents; treatment with various chemical agents which decrease the ordering of the macromolecule chains and hence increase the elasticity and elongation of the fibers; mixing cellulose fibers with various synthetic fibers during the spinning or weaving process. Some of the above methods are being used industrially; some are still in the experimental or laboratory stage. High cost and inadequate equipment are often limiting factors in the application of certain methods, e.g., partial cyanoethylation was recommended 10 to 12 years ago for strengthening some desirable characteristics of the cellulose fibers, but it presented

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difficulties in industrial application due to the high cost of acrylonitrile and to insufficiently hermetic equipment. Only after several years of additional studies was a continuous cyanoethylation process developed which precluded any side reactions and reduced the expenditure of acrylonitrile. The synthesis of graft polymers has not yet been solved satisfactorily; the reaction is difficult to regulate and yields a mixture of the initial polymers, graft copolymers, and homopolymers. This mixture can be used directly in the manufacture of some plastics but not in the manufacture of modified fibers; the latter requires a separation of the graft copolymer from the other polymer by means of fractional dissolving. The process requires, therefore, further investigation and development of a reaction which would preclude formation of the copolymer. The synthesis of graft cellulose copolymers with carbon chain polymers should be studied further, particularly in order to minimize the destruction of cellulose by the radicals formed in the decomposition of the diazo compounds. One of the authors

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recently synthesized a modified cellulose containing amino and nitrile groups; this reaction should be developed into an industrially acceptable process. The structure and the strength of natural fibers, such as ramie and flax, and of fortizan-type cellulose fibers (Z. A. Rogovin, Fundamentals of Chemistry and Technology of Chemical Fibers (Osnovy khimii i tekhnologii proizvodstva khimicheskikh volokon), Gizlegprom, 1957) can be improved by treatment with anhydrous ethylamine or 80% aqueous solution of ethylamine, concentrated urea solution, liquid ammonia, and other reagents which increase the elongation of the fibre considerably without reducing its tensile strength. The variant of this method suggested by American authors is expensive and uses considerable amounts of ethylamine which must be regenerated. The principle, however, seems to be interesting, particularly in connection with the problem of increasing the strength of viscose cord fibers which in foreign countries has been raised by 50-70% in the past 5-7 years. There is

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a method of producing extra-strong fortizan fibers with breaking length of 70-75 km but their low elongation (4-6%) limits practical application to cord manufacture. These extra-strong fibers were obtained from cellulose triacetate by stretching the fiber during hydrolysis, that is, at the time when the bonds are being rearranged and new-type bonds appear in the polymer's macromolecule. The above principle applied to other cellulose derivatives (e.g., cellulose xanthate) could yield extra strong fibers with increased elongation. Further studies are recommended to increase the life of cellulose fibers, fabrics, plastics, and films, (particularly their abrasion resistance and aging resistance) by impregnation with chemicals or by incorporating into the fibers various plasticizers and inhibitors of thermal oxidation and mechanical breakdown. Increased elasticity of the macromolecules is obtained in mixed cellulose esters with irregular structure, such as cellulose acetate-butyrate, or mixed esters of cellulose with acetic acid and higher fatty acids; the latter esters should

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require no addition of plasticizers. Attention must be given also to the plasticization of cellulose polymers with synthetic polymers, a method used widely in other high-molecular compounds technology, and to quality standardization of the cellulose polymer, which should be completely uniform and should contain as little as possible of admixtures or low-molecular fractions. The authors recommend a switch from batch cooking to continuous cooking, the use of wetting agents to facilitate the uniform diffusion of alkalis into the fiber, and replacing hypochlorite with other, milder reagents which do not act destructively on the cellulose macromolecule. New processing methods of wood pulp should also be investigated, particularly the so-called "hydrotropic method" which consists of treating the pulp with organic reagents at high temperature. Since practically all cellulose esters are thermoplastic, particularly acetyl- and ethyl-cellulose, the possibility of their extrusion into monofilaments and threads (similarly to saran filaments

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and polypropylene threads) should be investigated.
There are 6 references, 1 U.S., 1 U.N., 4 Soviet.
The U.S. reference is: N. Nelson, Conrad, Text. Res.
J., 23, 428 (1953).

Card 7/7

Kargin, V.A.

7.1

SCV/64-59-5-26/28

5(1)

AUTHOR:

None Given

TITLE:

11th All-Union Conference on High-molecular Compounds

PERIODICAL:

Khimicheskaya promyshlennost', 1959, Nr 5, p 459 (USSR)

ABSTRACT:

The 11th All-Union Conference on high-molecular compounds was convened in Moscow by Otdeleniye khimicheskikh nauk AN SSSR (Section of Chemical Sciences of AS, USSR), Gosudarstvennyy komitet Soveta Ministrov SSSR po Khimii (State Committee of the Council of Ministers of USSR for Chemistry), Vsesoyuznoye khimicheskoye obshchestvo imeni D. I. Mendeleeva (All-Union Chemical Society imeni D. I. Mendeleev) and Moskovskiy gosudarstvennyy universitet (Moscow State University) during the time from June 2nd to 7th of this year. About 2000 persons participated in this Conference, discussing problems of the application and utilization of polymer materials. The Conference was opened by Academician N. N. Semenov. Among others, the following lectures were held in the plenary sessions: Relations between structure and properties, of high-molecular compounds, by Academician V. A. Kargin: methods of altering the properties

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11th All-Union Conference on High-molecular Compounds SOV/64-59-5-26/28

of polymers, by Professor A. A. Berlin. During the Conference 8 study groups discussed problems of films, coating and adhesive materials, dielectrics, caoutchouc and rubber, chemical fibers, polymer materials for building, test methods for polymer materials, utilization of synthetics and, finally, polymer materials in machine construction. 263 lectures were held on the different application possibilities of polymers, and on the present position of scientific research and industry in this field. It was one of the tasks of the Conference to organize the contact between the different organizations working in the same field (Akademiya nauk SSSR (Academy of Sciences of the USSR), Akademiya nauk soyuznykh respublik (Academy of Sciences of the Union Republics), Goskomitet po khimii (State Committee of Chemistry), institutions of higher learning, sovnarkhozes, Ministerstvo stroitel'stva (Ministry of Construction), Akademiya arkhitektury i stroitel'stva (Academy of Architecture and Building), Ministerstvo kul'tury (Ministry of Culture), Ministerstvo zdoravookhraneniya (Ministry of Hygiene) etc). The resolution adopted by the Conference may only be realized by adequate assistance of the Academy of Sciences of the USSR, the State Committee of Chemistry, the Gosplan and other organizations.

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15(4)

AUTHORS:

S/183/59/000/06/015/027
B004/B007
Berestnev, V. A., Gatovskaya, T. V.,
Kargin, V. A., Yaminskaya, Ye. Ya.

TITLE:

The Mechanism of the Fatigue of Fibers

PERIODICAL:

Khimicheskiy volokna, 1959, Nr 6, pp 50 - 52 (USSR)

ABSTRACT:

The authors proceed from the experimentally proven fact that the destruction of fibers by fatigue is caused by macrodefects (Refs 5-8), which develop in the course of the fatigue tests in the fiber. In the present paper they endeavor to give a mathematical description of this process as a function $n = f(N, v)$ (n = number of stress changes leading to fatigue failure, N = number of occurring defects, v = rate of the increase of defects). In consideration of the duration of stress, the intensity of the frequency of stress changes, and the length of the specimen to be tested, the authors obtain the equation (9), the correctness of which they prove for various limiting cases and which they compare with the results obtained by M. P. Moscov (Fig) (a ... mention

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The Mechanism of the Polymerization

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B004/B007

M. S. Porodovskiy (Refs 9,10), and thank J. E. Horey for the experimental data placed at their disposal, as well as M. S. Gerasimov, S. E. Raykhov, and V. Z. Krasin for their advice. There are 1 figure and 11 references, 7 of which are Soviet.

ASSOCIATION: NII Khim. L. Ya. Karpova (Scientific Research Institute for Physical Chemistry named L. Ya. Karpov), NII Khimicheskoy promyshlennosti (Scientific Research Institute of the Chemical Industry)

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5(4)

SOV/69-21-3-5/25

AUTHORS: Gorina, A.A., and Kargin, V.A.

TITLE: A Study of the Sintering Mechanism of Fluoroplast-4 Stocks - 1. A Study of the Sorption Process

PERIODICAL: Kolloidnyy zhurnal, 1959, Vol XXI, Nr 3, pp 276-282 (USSR)

ABSTRACT: The authors report on a study of the sorption of low-molecular matter by fluoroplast-4 (polytetrafluorethylene) and the diffusion of dyes in fluoroplast-4. The foremost task to be accomplished was the evaluation of the molecular packing and the microporosity of the material, particularly during the sintering process. The investigation has shown, that pressed stocks (tablets) of fluoroplast-4 under specific pressures of 500 kg/cm² do not exhibit macroporosity. At an increase of the sintering temperature the sorption capacity of fluoroplast-4 diminishes, reaching its minimum value at temperatures between 327° C and 390°C. At higher sintering temperatures, the sorption

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SOV/69-21-3-5/25

A Study of the Sintering Mechanism of Fluoroplast-4 Stocks -
1. A Study of the Sorption Process

capacity increases. This shows that the sintering process can be realized between 327°C and 390°C .

Between 327°C and 360°C , however, this process proceeds very slowly, so that practically it will not be realized in this interval. At temperatures above

390°C destructive and relaxing processes can be observed. The latter result in higher porosity and, consequently, in an increase in the sorption capacity of the material. The optimum temperature interval

for the sintering of fluoroplast-4 tablets is $375 \pm 15^{\circ}\text{C}$. The fact that dyes identically permeate polyethylene and fluoroplast-4 testifies, that in both cases, the dyes diffuse in the mass of the polymeric substance and do not penetrate through its pores. In polyethylene, the rate of diffusion is considerably higher than in fluoroplast-4. During the sintering of the tablets, a closer packing of the polymer

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A Study of the Sintering Mechanism of Fluoroplast-4 Stocks -
1. A Study of the Sorption Process

macromolecules can be observed. This is due to the greater mobility of the molecules at high temperatures, which leads to the destruction of the molecular interfaces. The authors mention the Soviet scientist I.F. Kanavets [Ref 1_7]. There are 5 graphs, 5 tables and 3 Soviet references.

ASSOCIATION: Nauchno-issledovatel'skiy i proyektnyy institut
plasticheskikh mass, Moskva (Scientific Research
and Planning Institute of Plastics, Moscow)

SUBMITTED: 24 May, 1958

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15 (9)
AUTHORS:

Slonimskiy, G. L., Kargin, V. A.,
Reztsova, Ye. V. (Moscow)

SOV/76-33-5-5/33

TITLE:

On Mechano-chemical Phenomena in Polymers (O mekhano-khimicheskikh yavleniyakh v polimerakh). 4. The Modification of Mechano- and Vulcanized Rubber (4. Modifikatsiya kauchukov i rezin)

PERIODICAL:

Zhurnal fizicheskoy khimii, 1959, Vol 33, Nr 5,
pp 988-991 (USSR)

ABSTRACT:

Data from publications (Refs 1-7) indicate that free radicals are formed from mechanical action on raw- or vulcanized rubber and that it is therefore possible to start polymerization processes by mechanical treatment. The authors carried out their investigations in a modifcator which had been designed at the Institut plastmass (Institute of Plastics). It consisted of two spirally grooved plates. The upper plate was fixed, the lower plate rotated with 30 rpm. The plates were cooled; and the treatment could take place in air as well as in nitrogen atmosphere. Microcylinders with a friction of 1:1.11 were used in a different series of experiments. Technical products of butadien styrene and sodium butadien were investigated.

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On Mechano-chemical Phenomena in Polymers.

SOV/76-33-5-5/33

4. The Modification of Natural and Vulcanized Rubber

Vulcanization was carried out according to standard recipes. The mechanically treated samples were tested after vulcanization, and by fatigue tests of the raw product, and partly by determining the solubility and viscosity of the solutions. Equally, tests were carried out with vulcanized rubbers which were swelled into monomers (imitation of regeneration). Tables 1 and 2 give the investigation results and show that chemical processes are brought about by mechanical treatment which can be used for an improvement of the properties and for technical application contrary to earlier assumptions. There are 2 tables and 8 references, 4 of which are Soviet.

ASSOCIATION: Nauchno-issledovatel'skiy institut shinnoy promyshlennosti Moskva (Scientific Research Institute of the Tire Industry, Moscow)

SUBMITTED: August 8, 1957

Card 2/2

5(4)

AUTHORS:

Gatovskaya, T. V., Golova, O. P.,
Krylova, R. G., Kargin, V. A.

SOV/76-33-5-39/44

TITLE:

Investigation of the Sorption Properties of Cellulose in the
Process of Its Thermal Disintegration (Issledovaniye
sorbtsionnykh svoystv tsellyulozy v protsessе yeye termiches-
kogo raspada)

PERIODICAL:

Zhurnal fizicheskoy khimii, 1959, Vol 33, Nr 6, pp 1418-1421
(USSR)

ABSTRACT:

The experimental results of a previous paper (Ref 1) point to the fact that the process of thermal disintegration of cellulose (I) in the course of 90 minutes can be divided into two stages with different peculiarities (Table 1). It is assumed that the first reaction stage proceeds in less densely packed (I), whereas in the second reaction stage a higher packing density prevails and the yield of levoglucosane is proportional to this density. To investigate the packing density, a method with the use of sorption isothermals was applied to the present case. The sorption experiments were made on one of the investigation samples (Ref 1) of the cellu-

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Investigation of the Sorption Properties of Cellulose SOV/76-33-3-39/44
in the Process of Its Thermal Disintegration

lose SP-700 which was heated to 300° for 10, 20, 40 and 90 minutes at $1 \cdot 10^{-5}$ mm Hg. The sorption of the steam by (I) decreases with the time of treatment of (I) to a certain value (20 minutes time of treatment) and then remains constant. This points to a condensation of the (I)-packing by a reduction of its polymerization degree (Ref 5). In the first stage of the thermal (I)-disintegration characterized by a sudden rise in the levoglucosane yield, the maximum condensation of the molecule packing of (I) is attained. In a further disintegration of the basic mass of (I), these values remain constant. Thus, the experimental results confirm the previous statements (Refs 6, 7) that the formation of levoglucosane is considerably influenced by the thermal treatment of (I), i. e. its packing density. There are 2 figures, 2 tables, and 7 references, 6 of which are Soviet.

ASSOCIATION:

Fiziko-khimicheskiy institut im. L. Ya. Karpova, Moskva; Akademiya nauk SSSR, Institut lesa (Physico-chemical Institute imeni L. Ya. Karpov Moscow; Academy of Sciences of the USSR, Forestry Institute)

Card 2/3

5(4)

AUTHORS:

SOV/20-128-1-34/58
Igonin, L. A., Ovchinnikov, Yu. V., Kargin, V. A., Academician

TITLE:

The Influence of High Pressures on the Dielectric Losses in Polymers

PERIODICAL:

Doklady Akademii nauk SSSR, 1959, Vol 128, Nr 1, pp 127-129 (USSR)

ABSTRACT:

It was stated in a paper previously published (Ref 1) that in the pressing of pulverulent polymers under high pressure within a certain temperature interval vitrification of the polymer occurs. For a certain temperature the range, within which vitrification of the polymer occurs, is limited by two pressure heights. The assumption was expressed that this phenomenon may be explained by a reduced mobility of the molecule chains of the polymer. In order to check this by means of another, independent method, the temperature dependence of the dielectric losses δ was measured at various pressures. Figure 1 shows the mold. Polyvinyl chloride, polymethyl acrylate and polymethyl-methacrylate were pressed. Figure 2 shows the temperature dependence of $\tan \delta$ for polymethyl acrylate at a frequency of 5,000 cycles and pressures

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The Influence of High Pressures on the Dielectric Losses in Polymers

of from 1 to 2448 kg/cm². With increasing pressure the maximum of tg δ shifts towards higher temperatures. Figure 3 shows the frequency dependence of tg δ at a pressure of 2448 kg/cm² for the same compound. Increasing frequency (400, 1000, 5000 cycles) causes the same shifting of the maximum of the tg δ . The same behavior is shown by polyvinyl chloride. Figure 4 shows the temperature shifting ΔT of the maximum of the elastic dipole losses in the case of increasing pressure. In the case of polymethyl acrylate this shifting is directly proportional to pressure up to 2000 kg/cm². In polyvinyl chloride, $\Delta T_{\max}(p)$ becomes non-linear already at pressures above 1000 kg/cm². It is confirmed by experimental results that under high pressure the mobility of the molecule chains is hampered by tight packing, vitrification setting in according to the strength of the polymer chain at various pressures. In polymethylmethacrylate the measured maxima of the tg δ of the dipole-elastic losses are superimposed to the maxima of the dipole-radical losses (Ref 6). The authors thank Professor P. G. Mikhaylov for discussions and advice, and S. P. Kabin for assisting in carrying out experiments.

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5 (3)

AUTHORS:

Topchiyev, A. V.; Academician, Geyderikh, SOV/20-128-2-25/59
M. A., Davydov, B. E., Kargin, V. A.; Academician, Krentsel',
B. A., Kustanovich, I. M., Polak, L. S.

TITLE:

On the Possibility of Producing Polymeric Materials With
Semiconductor Properties From Polyacrylnitrile

PERIODICAL:

Doklady Akademii nauk SSSR, 1959, Vol 128, Nr 2, pp 312-315 (USSR)

ABSTRACT:

It is difficult to produce organic substances with electronic conductivity since the admitted zones, if they develop at all, are narrow here, whereas the forbidden zones are very wide. This width is so considerable that no electron excitation is caused at temperatures at which the substance concerned is not yet decomposed. The semiconductor properties of the substances described in publications are usually connected with existing condensed aromatic rings and nitrogen atoms (Ref 1). Current carriers are bound to develop comparatively easily in polymers with double bonds, especially with conjugated double bonds, furthermore with atoms in the chain which have electrons on the outer levels that do not take part in the chemical bond (e.g. nitrogen atoms). The electron dispersion in the latter is bound to be low in the case of a sufficiently regular polymer

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On the Possibility of Producing Polymeric Materials
With Semiconductor Properties From Polyacrylonitrile

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structure. The necessary regularity degree can be approximately estimated from the length of the free path of the electron in the semiconductor; furthermore from the length of the C—C-bonds, the length of the monomeric member, and the length of the electron wave. It was found that one polymeric molecule is sufficient in the main chain of which exists no branching with more than 12 carbon atoms per 35 monomeric members. This holds in the case of a fiber with maximum elongation in which the polymeric molecules are arranged in the direction of the current. Then, no dispersion on the structural irregularities is to be expected. The production of polymers with such a degree of regularity is well possible today. An investigation of the products of thermal transformation of polyacrylonitrile is interesting from the above standpoint. The view of the transformations proceeding here is explained by a scheme. Table 1 gives the results of measurement of the paramagnetic electron resonance of the polymers at room temperature. The method and the device used for this purpose are described in reference 3. From the data given in table 1 it follows that:

(1) the semiconductors obtained exhibit good electronic

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On the Possibility of Producing Polymeric Materials With SOV/20-128-2-25/59
Semiconductor Properties From Polyacrylnitrile

conductivity ($\Delta g < 0$). (2) The concentration of current carriers amounts to $10^{18} \sim 10^{19}$, the degeneration is therefore inconsiderable. (3) The half-width of the spectra of the paramagnetic electron resonance characteristic of the relaxation duration amounts to 10-20 gauss. Figure 1 shows the dependence of electrical conductivity on temperature for polyacrylnitrile which was obtained by a redox initiation and subjected to thermal transformation. The materials produced on the basis of polyacrylnitrile have properties typical of semiconductors, and may be used at increased temperatures (Fig 1). The influence of a γ -radiation on the polymer renders the subsequent thermal treatment still more effective with respect to the production of semiconductors. There are 1 figure, 2 tables, and 5 references, 3 of which are Soviet.

SUBMITTED: July 16, 1959

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1. (0), 5 (1,3), 15 (7)

AUTHORS: Gudimov, M. M., Kargin, Y. A., Academician, SOV/20-128-4-22/65
Petrov, B. V., Dumnov, M. V.

TITLE: Orientation of Massive Polymeric Materials

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 128, Nr 4, pp 715 - 718
(USSR)

ABSTRACT: Massive polymeric materials of linear structure: blocks, plates, etc. on the basis of polymethyl methacrylate, polystyrene, and the like, are often insufficiently solid, and particularly insufficiently plastic. This makes their use in technology difficult, sometimes even impossible. For this reason, it was usual for a long time to solve new technical problems, especially in machine building, by synthesizing new polymers offering the properties required. On the other hand, it had long been known that threads and films of polymers, in the production of which attention was paid to an orientation of macromolecules, offer both a higher strength and better plastic indices (Refs 1-7). This modification method makes it possible to produce new materials with given properties without having to change their chemical composition and the previous production technology. This can be achieved by an alter-

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Orientation of Massive Polymeric Materials

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ation of the orientation degree and by special additions which, for instance, ensure a scarce netting. Two promising production methods for oriented massive polymers were developed: the methods of radial stretching and of compression. Several machines were developed for the production of special material, e.g. for the glazing of airplane cabins (Fig 1). The production process according to both methods is described. Table 1 shows the physicommechanical indices of oriented polymethyl methacrylate produced according to the two above methods. It shows that these properties, at the same degree of previous stretching or compression, are practically equal on application of the two methods. This degree depends on the properties of the oriented material demanded. Figure 2 shows the dependence of the deformation modulus, strength limit, elongation by stretching etc. on the orientation degree. It appears from the experimental data that an increase in the degree of stretching beyond 50-70% does practically not bring about any quality improvement (except for the specific resilience) of the oriented polymer. Figure 3 compares the dependence of the said indices of an oriented and of a non-oriented polymer on the test tem-

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Orientation of Massive Polymeric Materials

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perature. It appears that several of these indices lie much higher in the former polymer than in the latter. The authors finally discuss the results obtained. There are 4 figures, 1 table, and 8 references, 4 of which are Soviet.

ASSOCIATION: Vsesoyuznyy nauchno-issledovatel'skiy institut aviatsionnykh materialov (All-Union Scientific Research Institute of Aircraft Material)

SUBMITTED: June 25, 1959

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SOV/20-129-4-36/68

AUTHORS:

Kozlov, P. V., Yendrykhovskaya, A., Kargin, V. A., Academician

TITLE:

Investigation of the Temperature-dependent Transformations in
Synthetic Polymers With Rigid Chains

PERIODICAL:

Doklady Akademii nauk SSSR, 1959, Vol 129, Nr 4, pp 844-846
(USSR)

ABSTRACT:

The authors investigated polyurea as a typical synthetic polymer with rigid chains. It was produced by polymerization on the boundary of two phases. Phosgene dissolved in benzene was emulsified with hexamethylenediamine dissolved with water. A 7% solution of sodium oleate served as emulsifier. If the 15% hexamethylenediamine solution is saturated with sodium chloride and soda, an amorphous powder with high molecular weight is formed, which is not soluble in any organic solvent with the exception of cresol and formic acid and has a highly ordered structure (Fig 1). The investigation of the temperature-dependent properties was carried out by means of dynamometric scales, a direct dependence of the deformation on temperature being found. Between 230-300°C chemical decomposition already occurs. In order to reduce the temperature at which polyurea is

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